ADDENDUM TO
REPORT ENTITLED

"EFFECTS OF GROUND-WATER DEVELOPMENT IN THE WILDER AREA, SOUTHWEST CANYON COUNTY, IDAHO"

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INTRODUCTION

Well owners located near Wilder are currently protesting an application for a new irrigation well. A report by the Idaho Department of Water Resources (Baker, Nov. 1991) entitled "Effects of ground-water development in the Wilder area, southwest Canyon County" addressed this issue. In the report, an attempt was made to assess the potential effects of pumping the protested well on the local aquifer system. Because of some questions over how realistic the pumping rates and pumping period used in these simulations were, additional drawdown simulations have been performed that are thought to more closely simulate the actual ground-water use in the area. This report presents the results of these findings.

WELL INTERFERENCE SIMULATIONS

Because of the far-reaching effects that were observed from the previous drawdown simulations, it seemed necessary to include all non-domestic wells within a two-mile radius from the protested well instead of just one mile that was used. A total of 16 well owners were identified from water right data in the area (seven more than were used in the original study). Locations of the wells are shown on each of the drawdown distribution maps (Figures 1 - 14).

All simulations use the same values for the hydraulic properties as were used in the original simulations. They include transmissivity equal to 6200 ft^2/day and storativity equal to 5.6×10^{-4}.

Two different approaches were used to simulate the pumping conditions in the area. The first set of simulations are based on maximum pump capacities and includes a cyclic pumping schedule that is representative of supplemental irrigation use. These simulations are numbered 1 through 4 and are shown on Figures 1 to 12. The second set of simulations are based on average continuous discharge rates that are needed to satisfy the maximum consumptive use requirements during the main portion of the irrigation season. These simulations are numbered 5 and are shown on Figures 13 and 14.

Discharge rates used in the first set of simulations were either measured during IDWR field exams, or if a field exam was not performed, they were computed from information obtained from the well owners regarding pump horsepower, pumping level, and back pressure at the wellhead. The overall pumping efficiency was also needed in the computations and was estimated to be 45 percent. This value for efficiency represents an average value that was computed from the wells where field exams were performed. The following formula was used to calculate theoretical discharge rate for these wells:

$$Q_t = ((HP * 8.8 * OE) / (PL + (2.31 * BP)) * 448.86$$

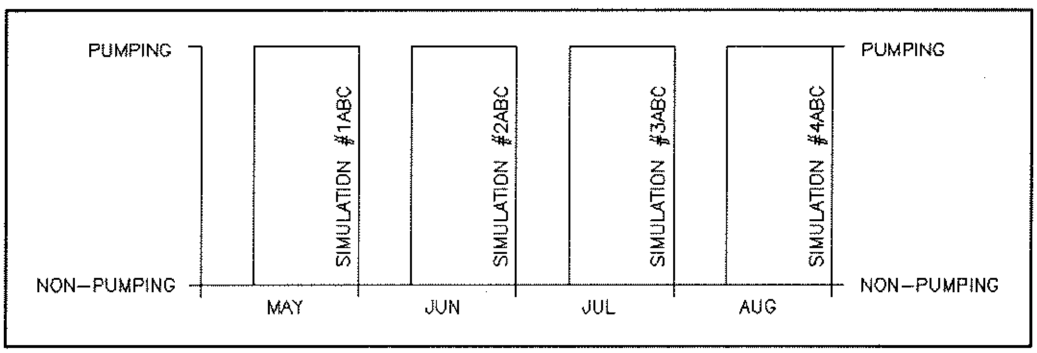
where

Q_t = theoretical discharge rate, in gallons per minute (gpm)
HP = horsepower of pump
OE = estimated overall efficiency
PL = pumping level, in feet (ft)
BP = back pressure at wellhead, in pounds per square inch (psi)

The measured and theoretical discharge rates for each of the wells used in the simulations are included on Table 1.

Three discharge rates were used for the protested well 04N-05W-10DDC1 for the first set of simulations. One rate was equal to zero and was included to show the distribution of drawdown without the effects of this well pumping. Simulations labeled with a letter "A" denote this pumping scenario. Another discharge rate that was used was based on the average rate that was measured during the 28-day aquifer test. Simulations using this pumping scenario are labeled with a letter "B". The last simulated rate of discharge was equal to the rate of diversion stated on the water right application. Simulations labeled with a letter "C" indicate this pumping scenario.

The cyclic pumping schedule used in the first set of simulations is based on an average schedule for supplemental irrigation use that was reported by well owners in the area. It consists of four 30-day periods, each of which represents the main months of the irrigation season: May, June, July, and August. Each 30-day period is composed of 10 days of non-pumping followed by 20 days of pumping. The figure shown below illustrates this idealized pumping schedule that was used in the simulations. The numbers used to label the first set of simulations correspond to each of pumping periods. For example, simulations numbered 1 represent the drawdown distribution at the end of first pumping period.



Idealized pumping schedule used in simulations

Table 1. Parameters used in well interference simulations

Water right number: A - Application; C - Claim; L - Licensed; P - Permit.

Use of water: H - Domestic; I - Irrigation; I_S - Irrigation (supplemental use); N - Industrial; P - Public Supply.

Well number(s)	Well owner	Water right number(s)	Use of water	Measured[1] or Theoretical[2] discharge rate (gpm)	Average continuous[3] discharge rate (gpm)
04N-05W-03ADA1	Rim Ranches	63-08531(L)	I_S	848[1]	523
03BCC1	Gooding Farms	63-10465(L) 63-10580(P)	I_S	1162[1]	654
03CDC1	Yoshie Yamada	63-08567(L)	I_S	911[1]	314
10ABB1	Gooding Farms	63-10579(P)	I_S	543[2]	340
10DAD1,2	SSI Food Services	63-10727(L) 63-11254(P)	I/N	399[1]	327
10DDC1	Rim Ranches	63-11474(P) 63-11551(A)	I_S	1739[1] 2693[4]	1275
13BBC1	Buckeye Ranch	63-10578(L)	I_S	1095[1]	629
14CAD1	Phil Church	63-20543(P)	I_S	426[2]	157
14CC1,2,3,4	City of Wilder	63-08164(L) 63-11253(P)	I/P	265[2]	265
15AAA1	Hetrick	--	H	--	--
15ABA1	Hetrick	--	H	--	--
16ADC1	Wilder Farm's	63-80649(L)	I_S	1023[1]	604
22BAD1	Batt	63-11124(P)	I_S	794[2]	586
23BBC1	Batt	63-04428(C)	I_S	889[2]	412
23BCB1	Housing Authority	63-11333(P)	I_S	157[2]	144
23DAD1	Gross	63-04455(C)	I_S	180[2]	170
23DCC1	O Bar L Inc.	63-08665(L)	I_S	269[1]	269
24ACD1	Wilder Land Co.	63-08703(L)	I_S	1338[1]	429

[1] - measured by IDWR personnel during water right field exam or August 1991 aquifer test.
[2] - based on pump HP and estimated total dynamic head with an assumed overall efficiency of 45 percent.
[3] - based on consumptive use (4.5 AF/A for sole & 2.25 AF/A supplemental) for a 120-day irrigation period.
[4] - amount listed on water right application.

Discharge rates for the second set of simulations (number 5) were computed using the following formula:

Q_a = (IA * CU * 226.7) / 120-day pumping period

where

Q_a = average continuous discharge rate, in gpm
IA = total irrigated acreage stated on water right
CU = consumptive use, in acre-feet per acre (AF/A)
for sole irrigation use, CU = 4.5 AF/A
for supplemental irrigation use, CU = 2.25 AF/A

A 120-day continuous pumping period was used because it was thought to represent the main portion of irrigation season from May to August.

The average continuous discharge rates for each of the wells used in the simulations are included on Table 1.

A similar approach to the first set of simulations was used to assess the difference between not pumping and pumping the protested well (04N-05W-10DDC1). The simulation labeled "5A" illustrates the drawdown distribution without the well pumping. Whereas, the one labeled "5B" shows the effects of pumping it at an estimated average continuous discharge rate.

Computed drawdowns at the two domestic wells (04N-05W-15AAA1 and 04N-05W-15ABA1) near the protested irrigation well are listed on Table 2 for each of the simulations.

CONCLUSIONS

As was mentioned in the previous report on the Wilder area, well interference during the irrigation season, especially May through August appears to be significant problem. This is primarily due to the relatively low hydraulic properties of the local aquifer system that were computed from the aquifer test and is also evident by the fine-grained stratified nature of the aquifer material that has been described on Well Driller's Reports for wells in the area.

Table 2. Computed drawdowns at domestic wells 04N-05W-15AAA1 and 04N-05W-15ABA1

Simula-tion No.	Pumping Schedule **P** - Pumping; **R** - Recovery	Well 04N-05W-10DDC1 pumping rate (gpm)	Drawdown at well 04N-05W-15AAA1 (ft)		Drawdown at well 04N-05W-15ABA1 (ft)	
			Total	Difference	Total	Difference
1a	**R**: One 10-day period	0	60	--	59	--
1b	**P**: One 20-day period	1739	89	29	85	26
1c		2693	104	44	99	40
2a	**R**: Two 10-day periods	0	73	--	72	--
2b	**P**: Two 20-day periods	1739	103	30	99	27
2c		2693	120	47	114	42
3a	**R**: Three 10-day periods	0	79	--	78	--
3b	**P**: Three 20-day periods	1739	111	32	107	29
3c		2693	128	49	123	45
4a	**R**: Four 10-day periods	0	84	--	83	--
4b	**P**: Four 20-day periods	1739	117	33	113	30
4c		2693	135	51	130	47
5a	**P**: One 120-day period	0	60	--	60	--
5b		1275	87	27	84	24

SOUTHWEST CANYON COUNTY

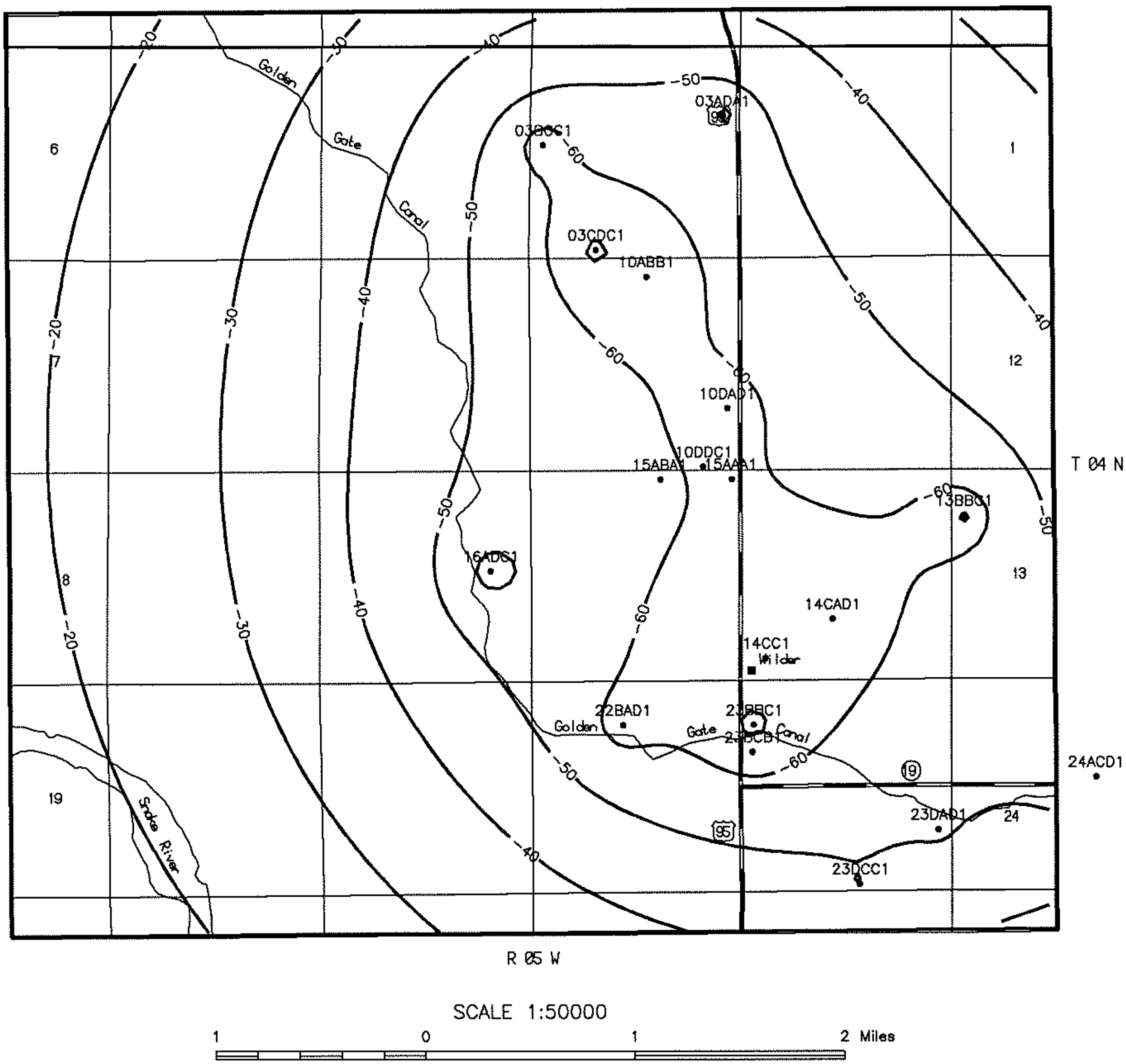


Figure 1. DRAWDOWN DISTRIBUTION FOR SIMULATION #1A

SOUTHWEST CANYON COUNTY

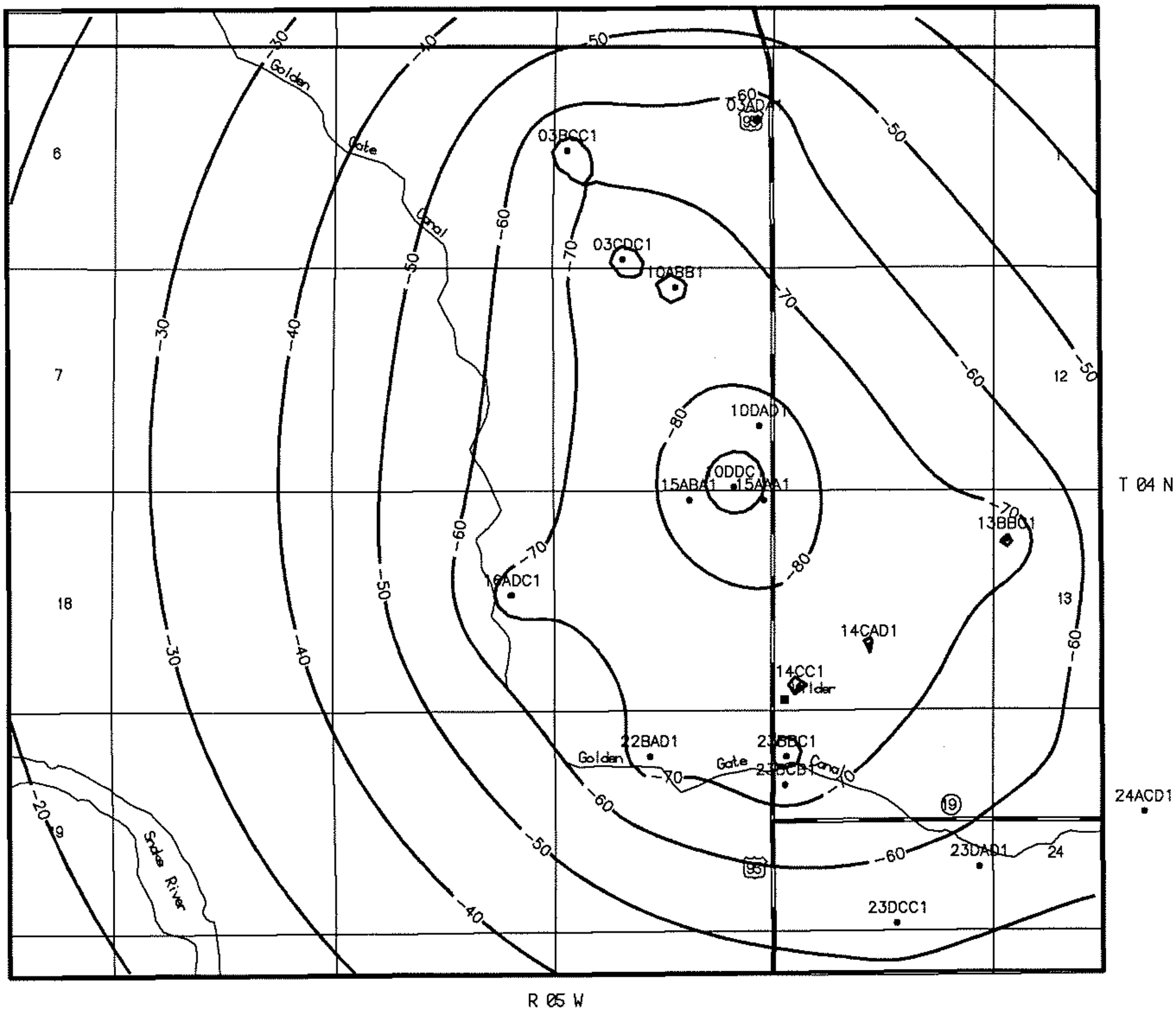


Figure 2. DRAWDOWN DISTRIBUTION FOR SIMULATION #1B

SOUTHWEST CANYON COUNTY

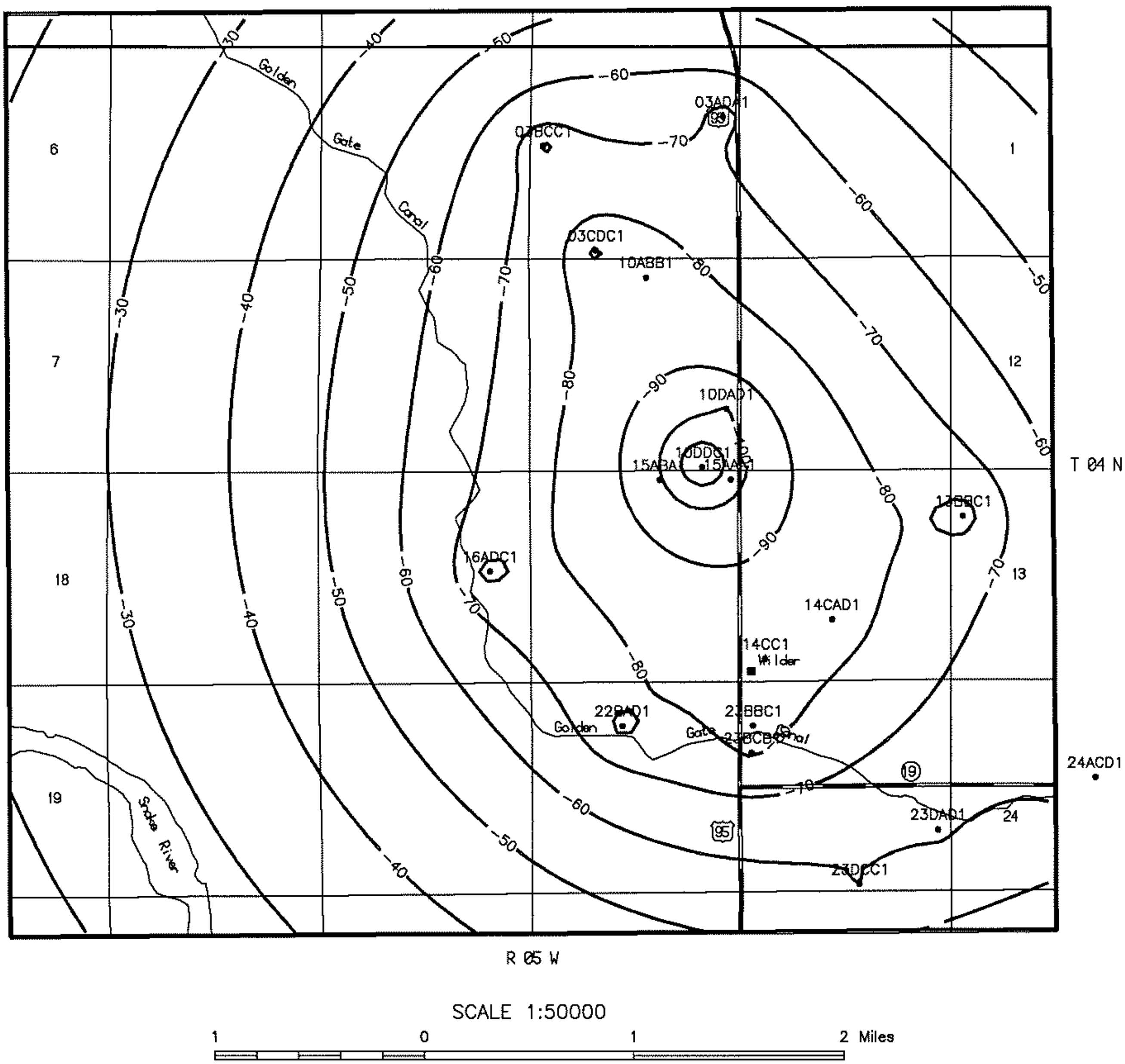


Figure 3. DRAWDOWN DISTRIBUTION FOR SIMULATION #1C

SOUTHWEST CANYON COUNTY

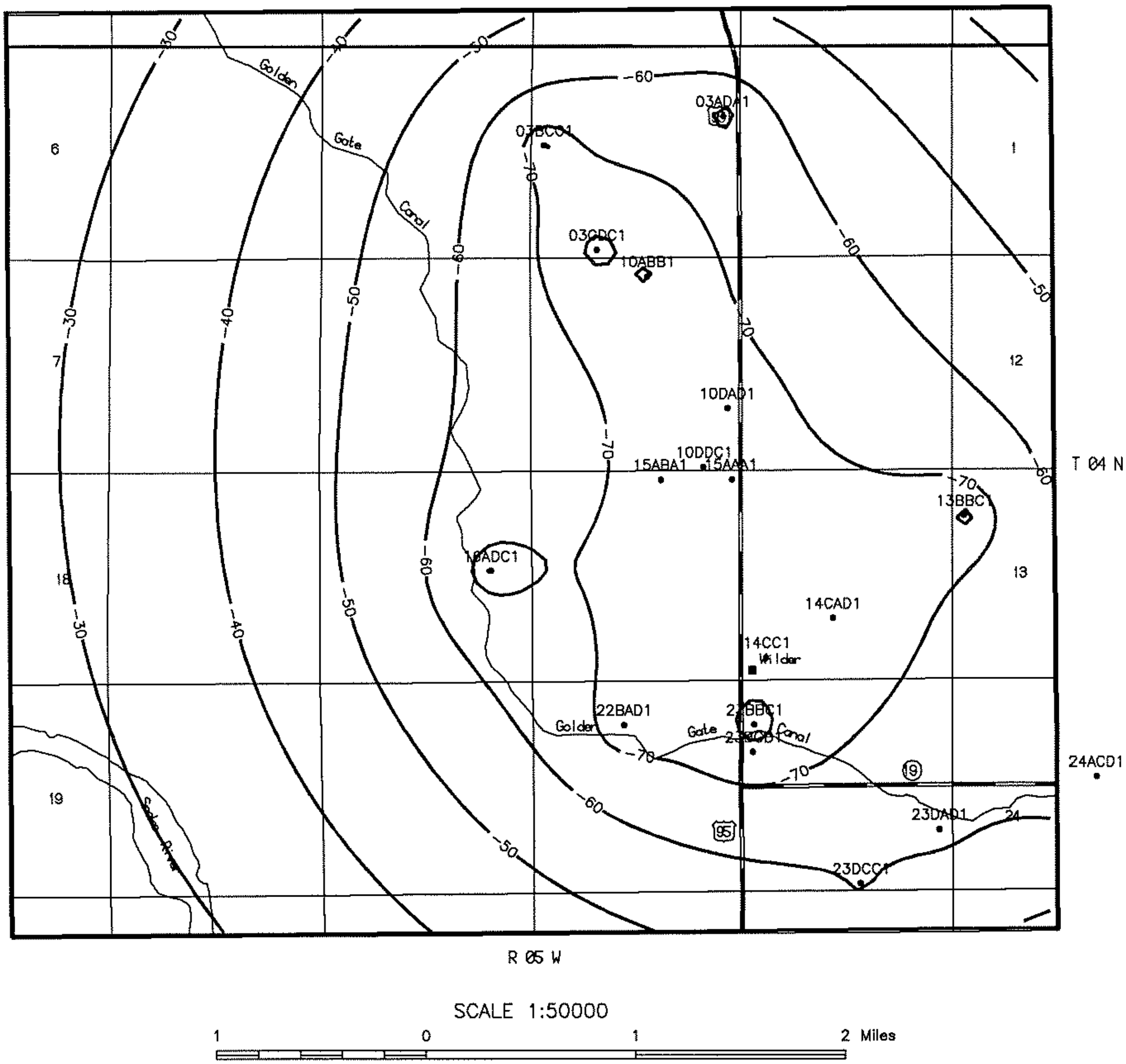


Figure 4. DRAWDOWN DISTRIBUTION FOR SIMULATION #2A

SOUTHWEST CANYON COUNTY

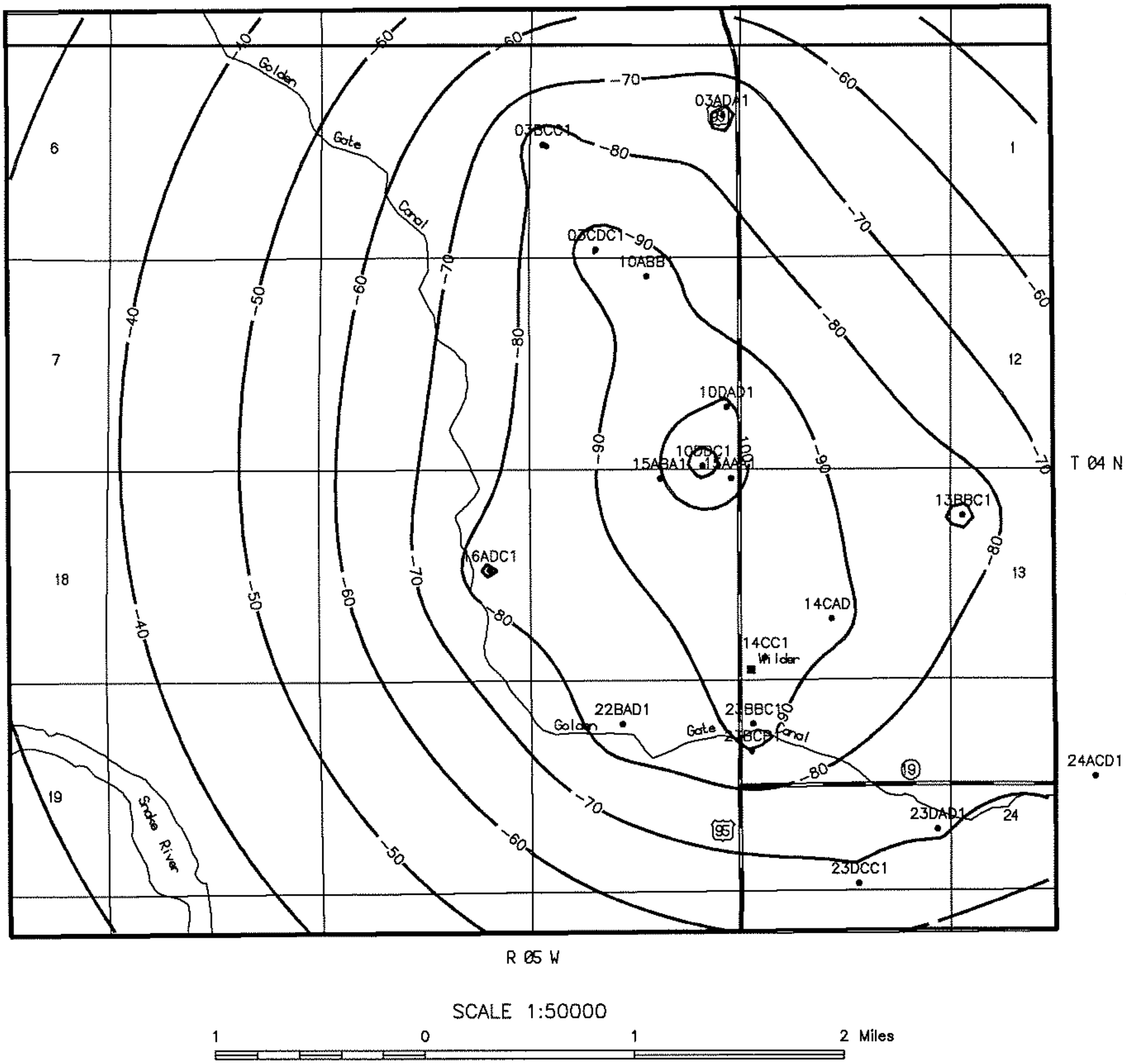
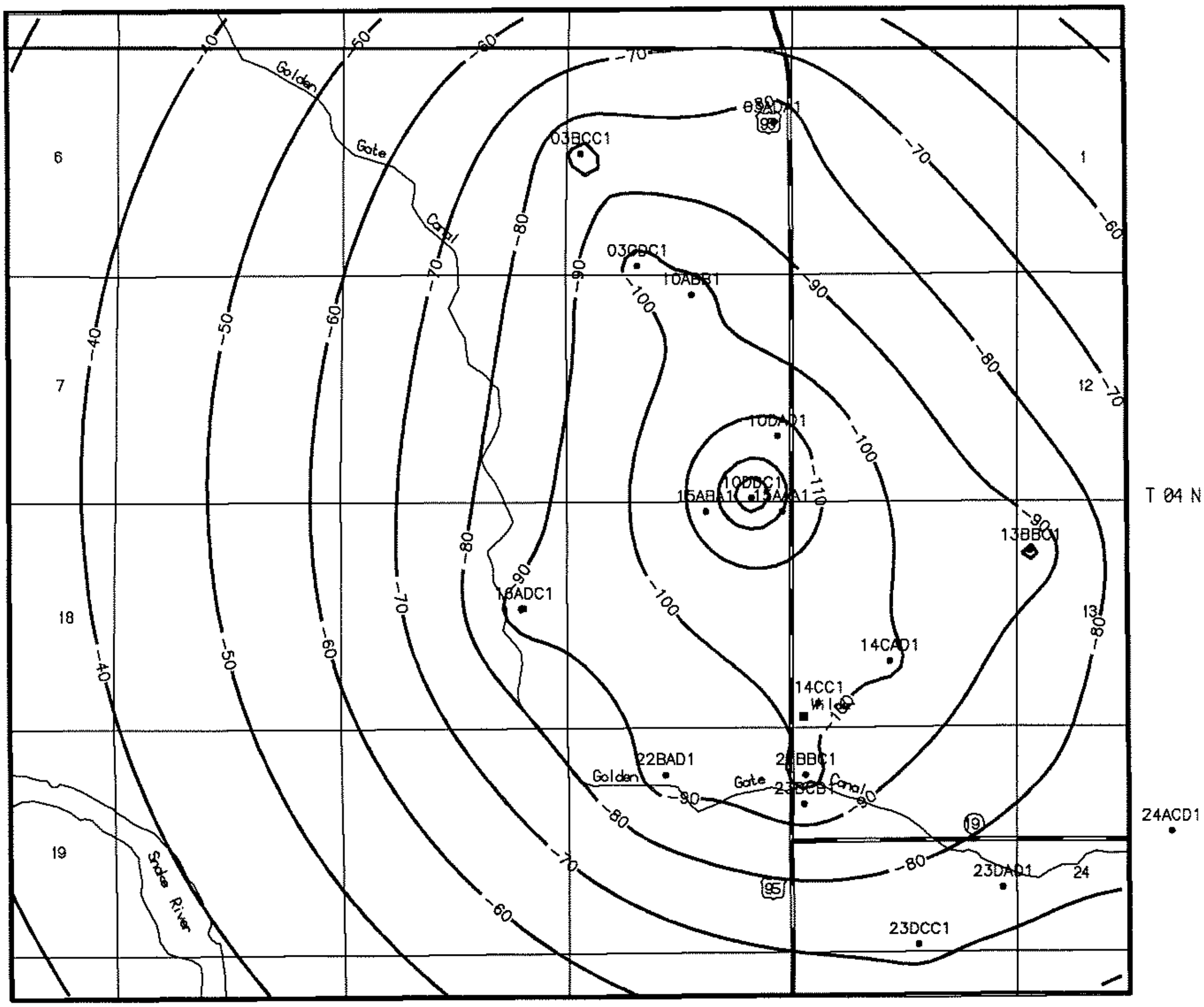


Figure 5. DRAWDOWN DISTRIBUTION FOR SIMULATION #2B

SOUTHWEST CANYON COUNTY



SCALE 1:50000

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Figure 6. DRAWDOWN DISTRIBUTION FOR SIMULATION #2C

SOUTHWEST CANYON COUNTY

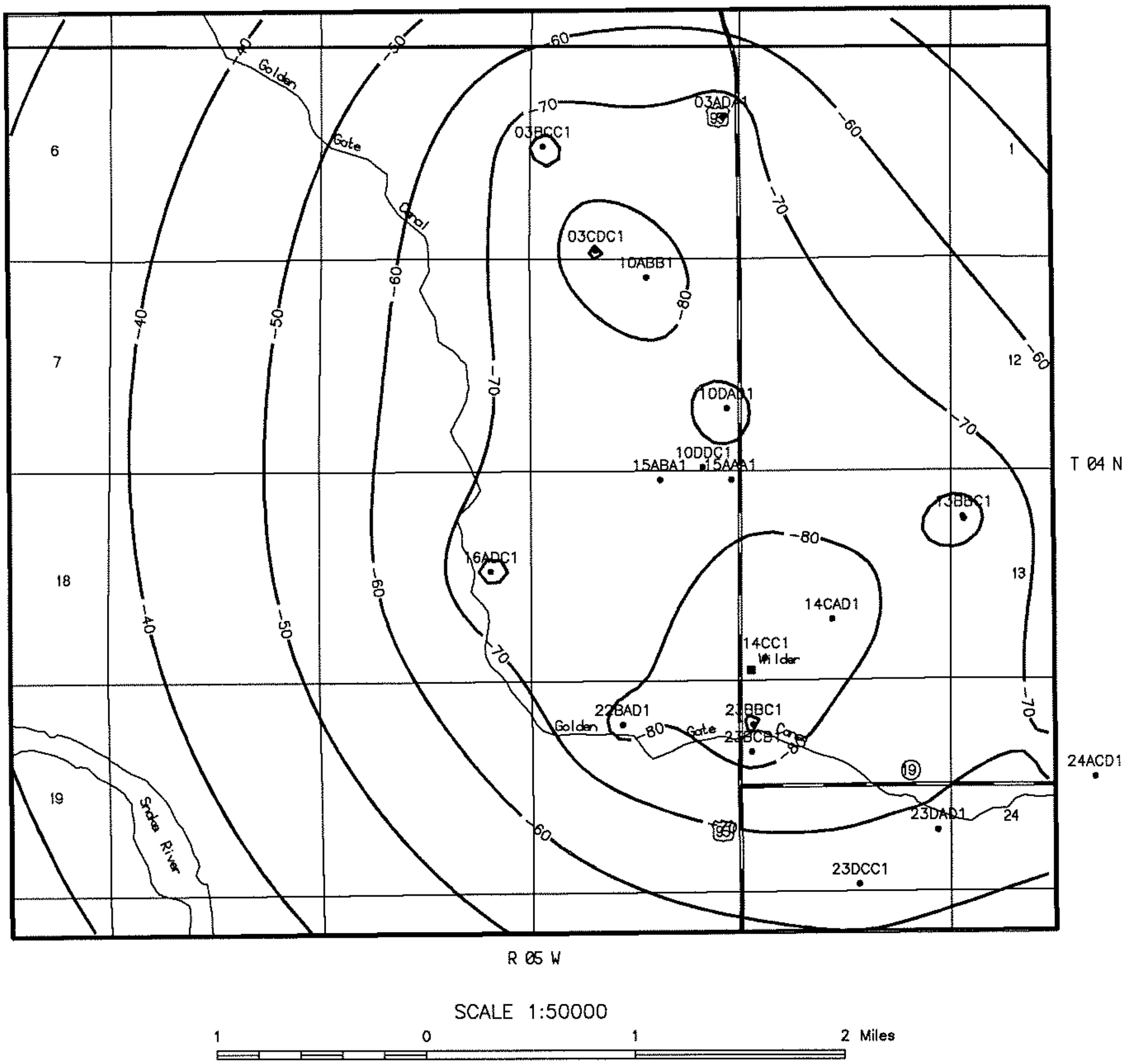

Figure 7. DRAWDOWN DISTRIBUTION FOR SIMULATION #3A

SOUTHWEST CANYON COUNTY

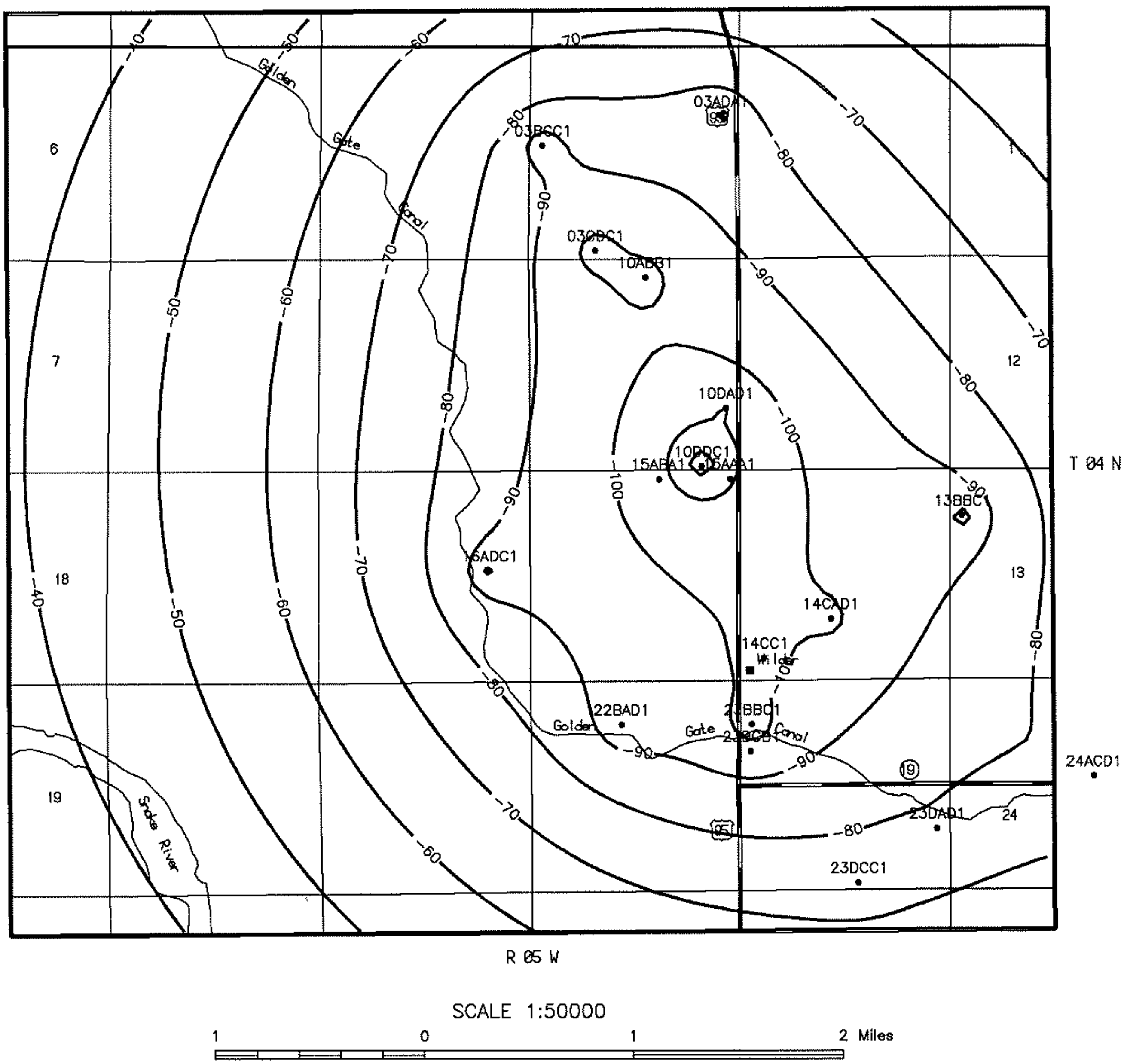

Figure 8. DRAWDOWN DISTRIBUTION FOR SIMULATION #3B

SOUTHWEST CANYON COUNTY

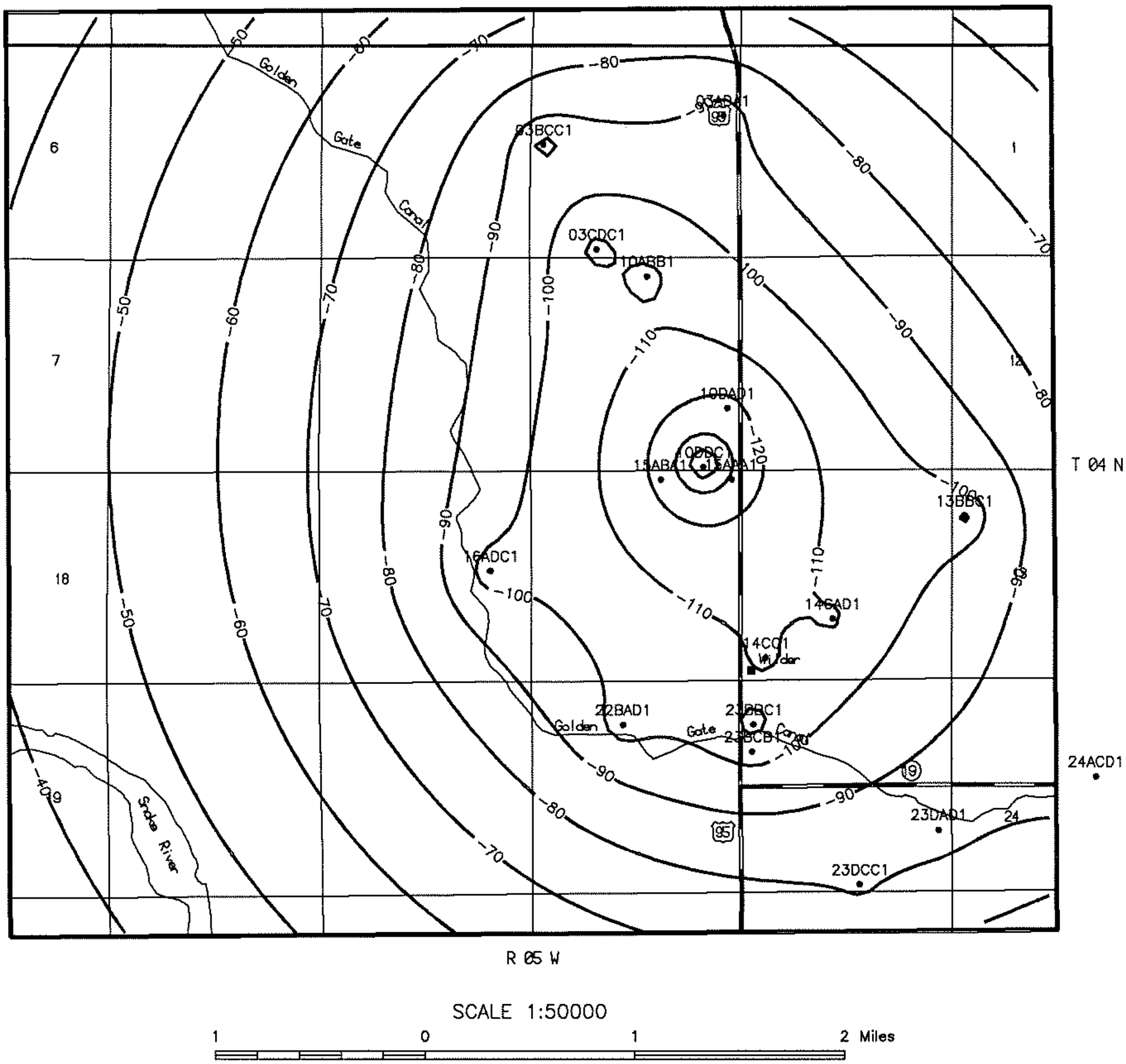

Figure 9. DRAWDOWN DISTRIBUTION FOR SIMULATION #3C

SOUTHWEST CANYON COUNTY

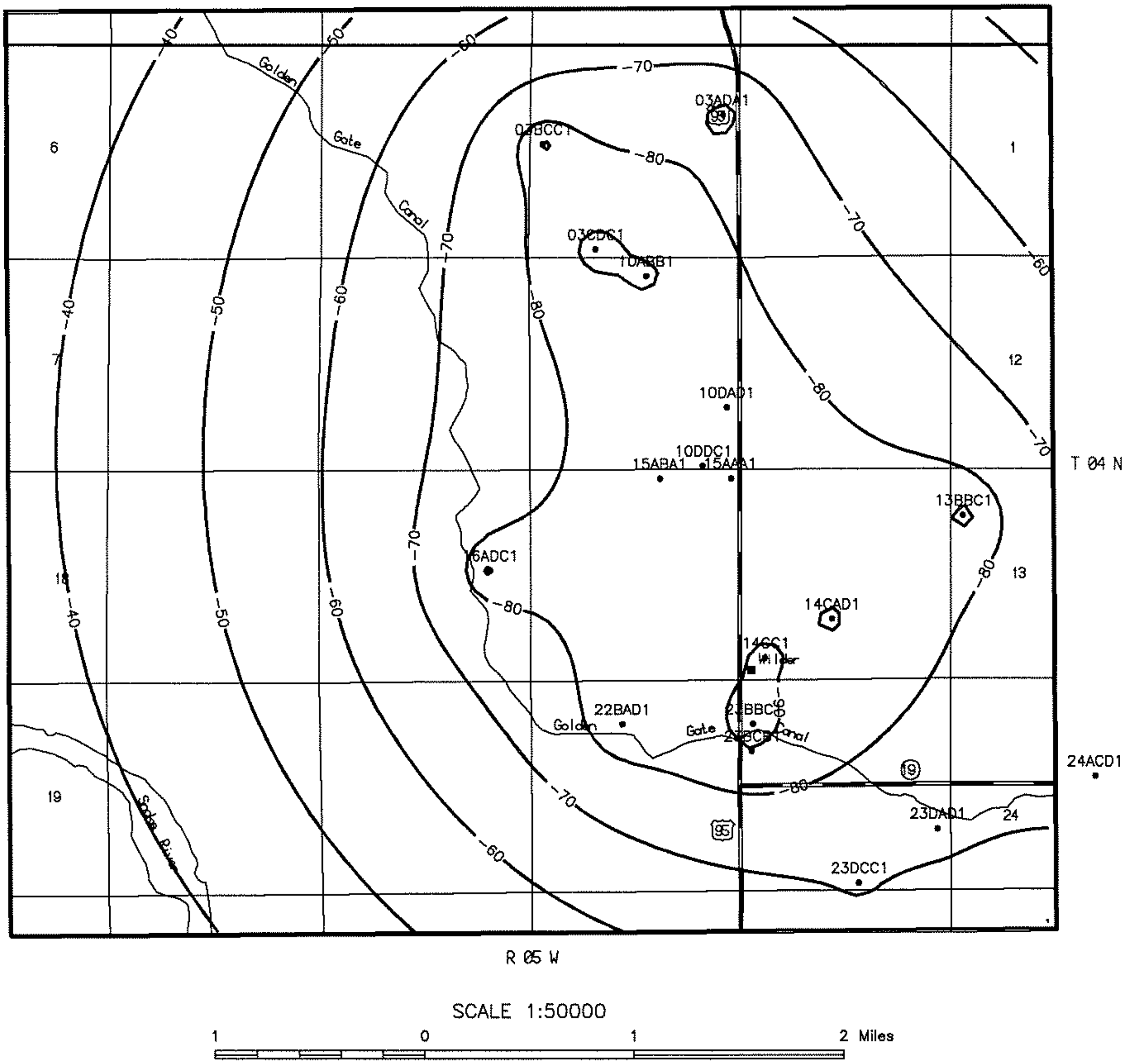

Figure 10. DRAWDOWN DISTRIBUTION FOR SIMULATION #4A

SOUTHWEST CANYON COUNTY

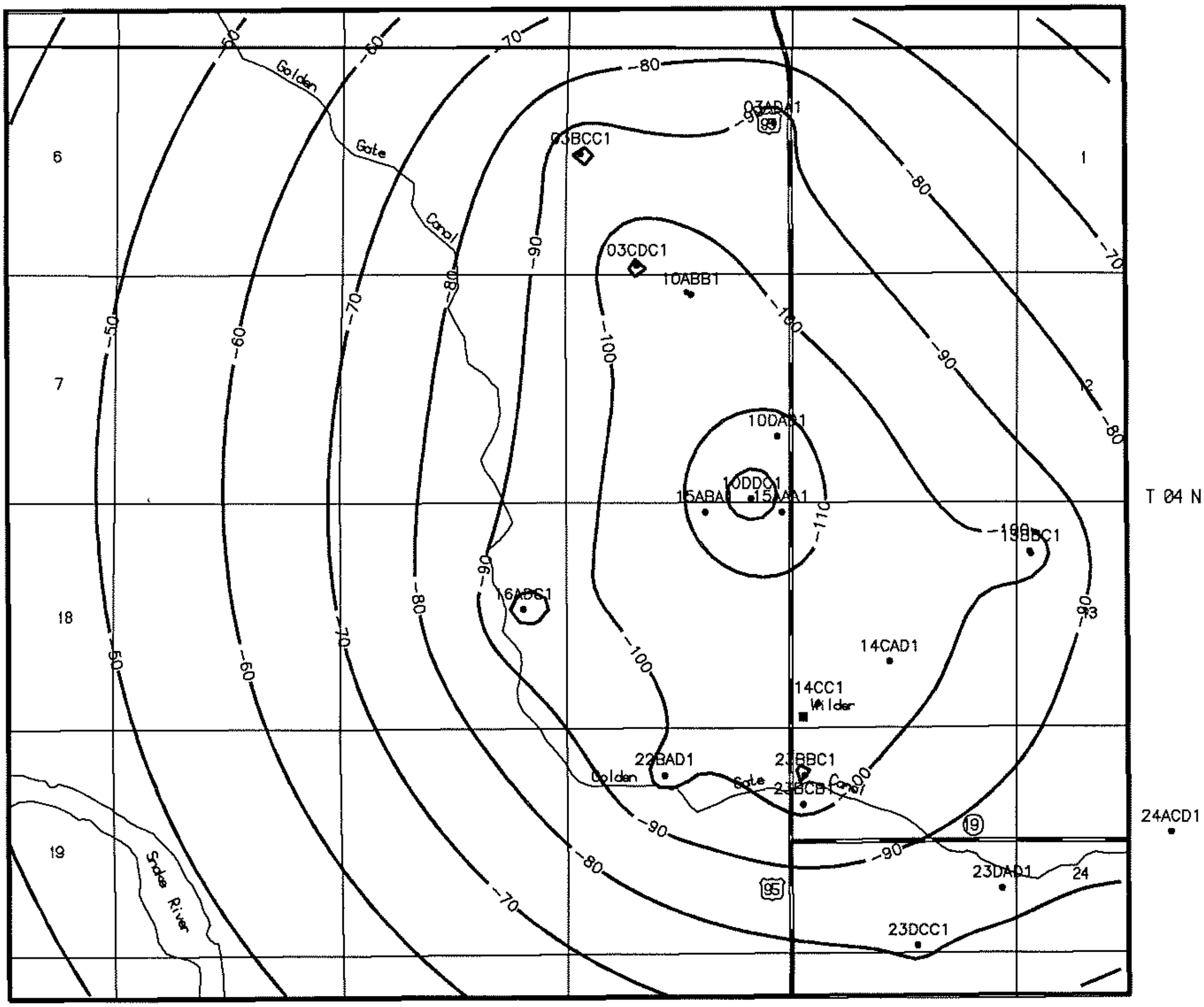

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Figure 11. DRAWDOWN DISTRIBUTION FOR SIMULATION #4B

SOUTHWEST CANYON COUNTY

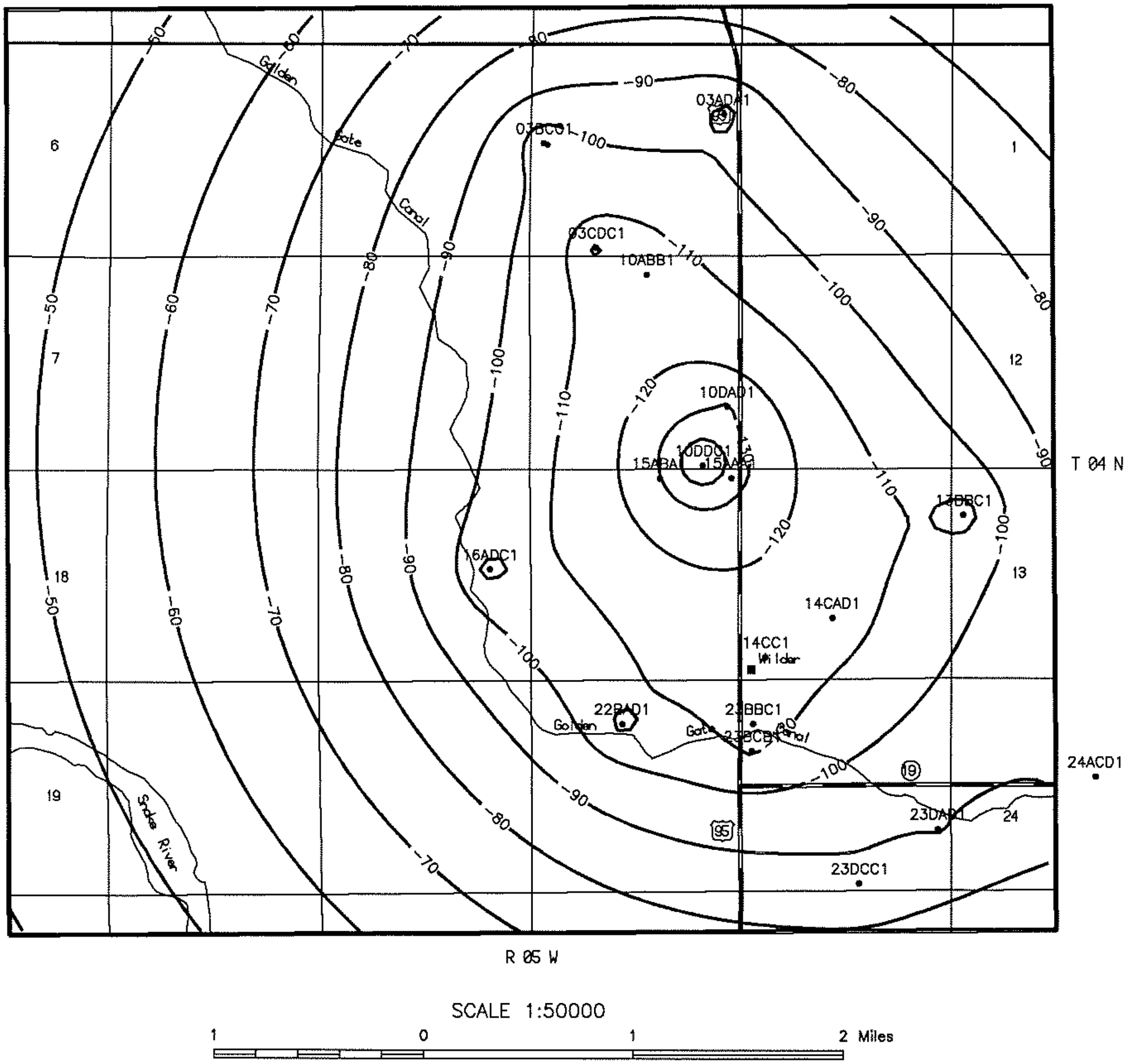
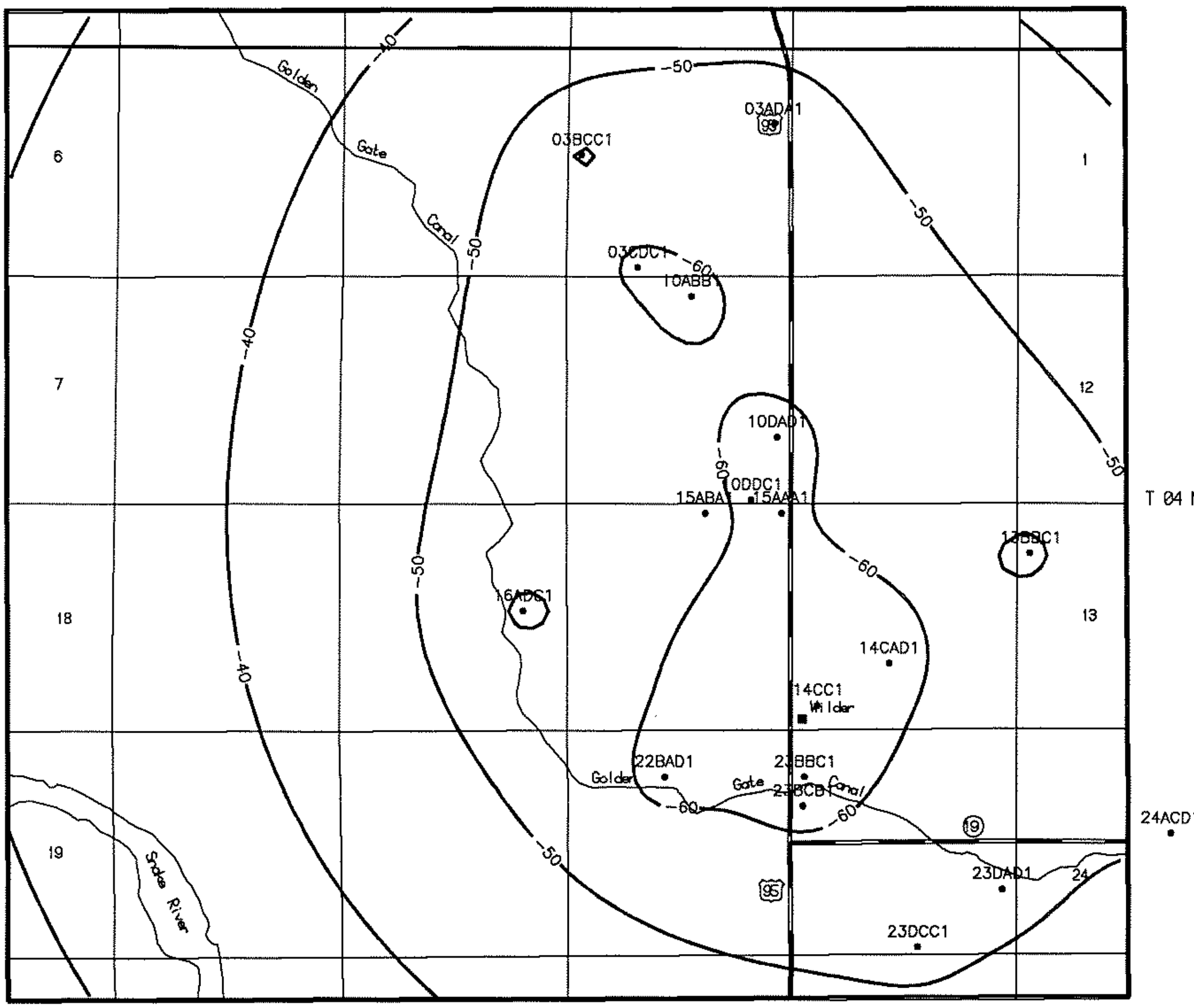


Figure 12. DRAWDOWN DISTRIBUTION FOR SIMULATION #4C

SOUTHWEST CANYON COUNTY



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1 0 1 2 Miles

Figure 13. DRAWDOWN DISTRIBUTION FOR SIMULATION #5A

SOUTHWEST CANYON COUNTY

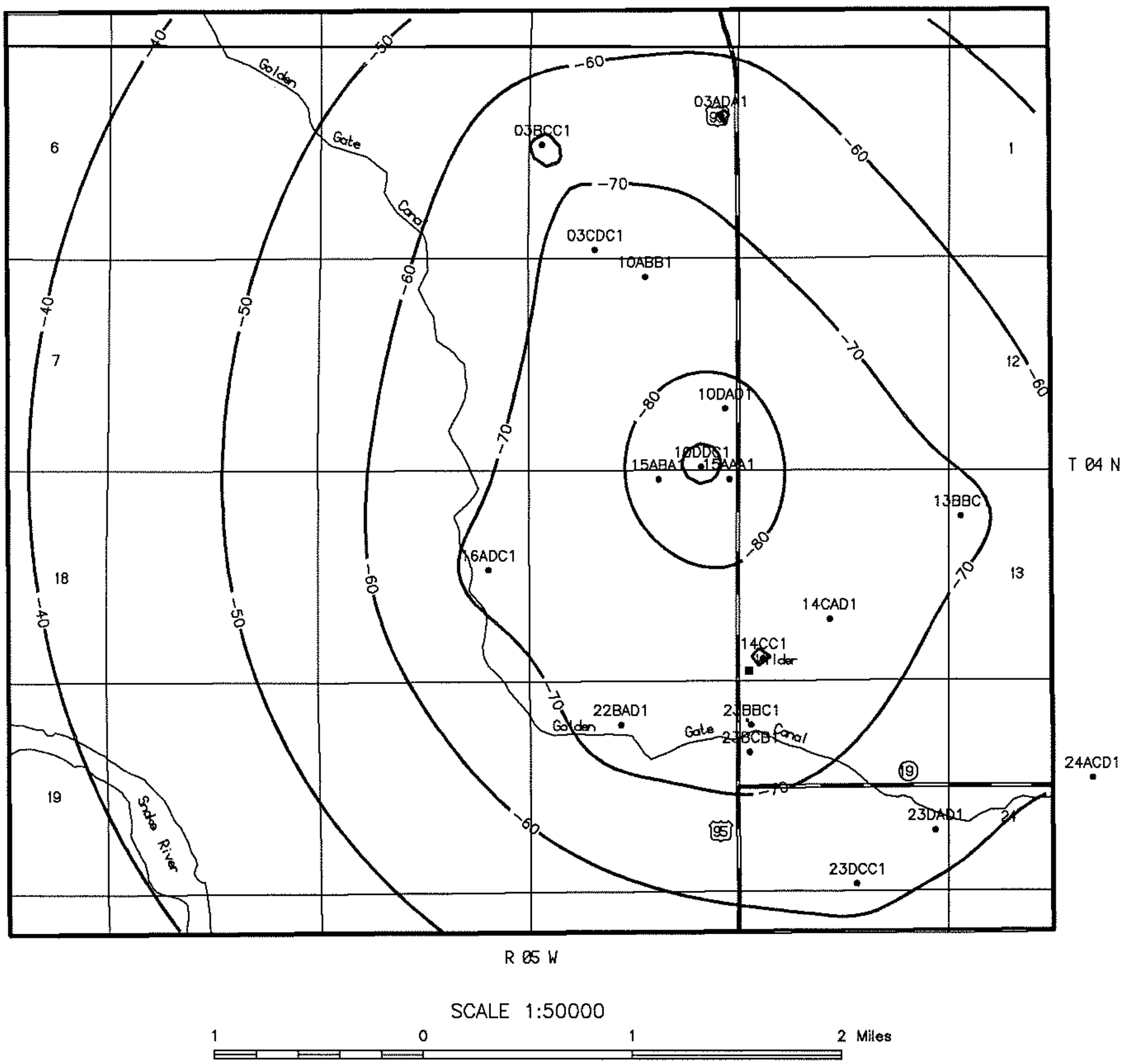

Figure 14. DRAWDOWN DISTRIBUTION FOR SIMULATION #5B